DSC 465, Homework 3

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Contents


```
# Load library
library(wooldridge)
```

Question 1

(a)

(b)

(c)

```
model_1 = glm(abuse ~ mothalc + fathalc, family = 'binomial', data = alcohol)
summary(model_1)
```

```
##
## Call:
## glm(formula = abuse ~ mothalc + fathalc, family = "binomial",
##     data = alcohol)
##
## Deviance Residuals:
##     Min       1Q   Median       3Q      Max
## -0.6552  -0.4333  -0.4333  -0.4333   2.1965
##
## Coefficients:
##             Estimate Std. Error z value Pr(>|z|)
## (Intercept) -2.31832    0.03862 -60.024  < 2e-16 ***
## mothalc      0.38506    0.14613   2.635  0.00841 **
## fathalc      0.50390    0.08347   6.037 1.57e-09 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##     Null deviance: 6349.8  on 9821  degrees of freedom
## Residual deviance: 6303.8  on 9819  degrees of freedom
## AIC: 6309.8
##
## Number of Fisher Scoring iterations: 5
```

```r
model_3 = glm(abuse ~ mothalc * fathalc, family = 'binomial', data = alcohol)
summary(model_3)
```

```
##
## Call:
## glm(formula = abuse ~ mothalc * fathalc, family = "binomial",
##     data = alcohol)
##
## Deviance Residuals:
##     Min       1Q   Median       3Q      Max
## -0.6518  -0.4332  -0.4332  -0.4332   2.1966
##
## Coefficients:
##                 Estimate Std. Error z value Pr(>|z|)
## (Intercept)     -2.31877    0.03898 -59.491  < 2e-16 ***
## mothalc          0.39696    0.19933   1.992   0.0464 *
## fathalc          0.50618    0.08742   5.791 7.02e-09 ***
## mothalc:fathalc -0.02558    0.29282  -0.087   0.9304
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##     Null deviance: 6349.8  on 9821  degrees of freedom
## Residual deviance: 6303.8  on 9818  degrees of freedom
## AIC: 6311.8
##
## Number of Fisher Scoring iterations: 5
```

(i)

```r
odds_ratio = exp(cbind(coef(model_1), confint(model_1)))
odds_ratio
```

```
##                            2.5 %    97.5 %
## (Intercept) 0.0984387 0.09119054 0.1060991
## mothalc     1.4697085 1.09448316 1.9425872
## fathalc     1.6551649 1.40283289 1.9460949
```

Answer:

For model (1), the odds ratio

- **OR(abuse == 1 | mothalc == 1)** is 1.4697085 with 95% confidence interval, (1.0944832, 1.9425872)
- **OR(abuse == 1 | fathalc == 1)** is 1.6551649 with 95% confidence interval, (1.4028329, 1.9460949)